

REMARKS

Entry of the foregoing, reexamination and reconsideration of the subject application are respectfully requested in light of the amendments above and the comments which follow.

As correctly noted in the Office Action Summary, claims 1-11 were pending. By the present response, claims 1-11 have been amended and claims 12-14 have been added. Thus, upon entry of the present response, claims 1-14 remain pending and await further consideration on the merits.

Support for the foregoing amendments can be found, for example, in at least the following locations in the original disclosure: page 1, lines 18-19; page 2, lines 8-9; page 4, lines 3-5, and 29-32; page 5, line 1; and the original claims.

OBJECTION TO THE SPECIFICATION

The specification stands objected to on the grounds set forth in paragraphs 1-2 of the Official Action. By the present response, applicants have amended the specification in a manner which is believed to address the above-noted objections. Thus, reconsideration and withdrawal of the objections is respectfully requested.

CLAIM OBJECTIONS

Claims 3 and 9 are objected to because of informalities. Claims 3 and 9 have been amended in a non-narrowing manner to address the objections. Thus, reconsideration and withdrawal of the objection is respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. §112

Claim 6 stands rejected under 35 U.S.C. §112, second paragraph, on the grounds set forth in paragraph 7 of the Official Action.

By the present response, applicants have amended claim 6 in a manner which addresses the above-noted rejection, without narrowing the scope thereof. Therefore, reconsideration and withdrawal of the rejection is respectfully requested.

CLAIM REJECTIONS UNDER 35 U.S.C. §102

Claims 1-7, 10 and 11 stand rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,280,284 to Winefordner et al. (hereafter "*Winefordner et al.*") on the grounds set forth in paragraph 10 of the Official Action. For at least the reasons noted below, this rejection should be withdrawn.

The present invention is directed to an improved propulsion arrangement. In particular, the present invention is directed to an arrangement in a counter rotating propulsion system (CRP). The unique nature of CRP systems present certain unique engineering and design challenges. For instance, circulation of water around the forward propeller tends to form a vortex near the hub associated therewith. This hub vortex can produce damaging cavitation which can be very harmful to the propulsion unit associated with the forward propeller, as well as the propulsion unit and its components located abaft. Another unique problem associated with a CRP systems is an additional cavitation effect produced when the aft propeller is pivoted, such as when a thruster is turned to steer a vessel, the aft propeller operates in the wake of the forward propeller while the aft propeller is turned at an angle relative to

the forward propeller (see, e.g., page 1, lines 15-19). This form of cavitation is sometimes referred to as "sheet cavitation."

An arrangement constructed according to a first aspect of the present invention is set forth in amended claim 1. Amended claim 1 recites:

1. Arrangement in a counter rotating propulsion system comprising an aft propeller installed on a thruster rotatable about a vertical axis, and a forward propeller installed on a shaft or on a thruster, whereby the aft propeller and the forward propeller have opposite directions of rotation and the aft and forward propellers are arranged opposing each other, each of the propellers having a hub with a cap, the hub and cap associated with the forward and aft propellers are arranged opposing each other, wherein at least two equally distributed flow blades are arranged on the cap of the forward propeller and that the flow blades are radially projecting from the cap.

According to a further aspect, an arrangement formed according to the principles of the present invention is set forth in amended claim 11. Amended claim 11 recites:

11. Arrangement in a counter rotating propulsion system, comprising an aft propeller installed on a thruster rotatable about a vertical axis, and a forward propeller installed on a shaft or on a thruster, the aft propeller and the forward propeller have opposite directions of rotation and the aft and forward propellers are arranged opposing each other, wherein each of the propellers have a hub with a cap, whereby the hub and cap associated with the forward and aft propellers are arranged opposing each other, at least two equally distributed flow blades are arranged on the cap of the forward propeller and the flow blades are radially projecting from the cap.

Winefordner et al. fails to anticipate the presently claimed invention, as set forth above in amended claim 1 or 11.

For instance, claims 1 and 11 require, *inter alia*, "a thruster rotatable about a vertical axis," and a hub and a cap associated with both the forward and aft propeller which are "arranged opposing each other."

Winefordner et al. is directed to a toy submarine with counter rotating propellers. The toy described by *Winefordner et al.* includes ridges 56 which presumably facilitate grasping and twisting first and second longitudinally adjacent sections of the toy relative to one another, which in turn acts to load a rubber band, thereby providing a rotational force to the two longitudinally adjacent sections. In particular, it is noted that the toy described by *Winefordner et al.* includes: "one end of the tail pieces' body mates with one end of the end pieces body such that their axes are aligned" Thus, as readily apparent from the above, the toy described by *Winefordner et al.* fails to include an aft propeller installed on a thruster that is rotatable about a vertical axis, and also fails to disclose a hub and a cap associated with forward and aft propellers which are arranged opposing each other. Thus, *Winefordner et al.* clearly fails to anticipate claims 1 or 11. Reconsideration and withdrawal of the rejection is respectfully requested.

The remaining claims depend either directly or indirectly upon claim 1. Thus, these claims are also distinguishable over *Winefordner et al.* for at least the same reasons noted above.

CLAIM REJECTIONS UNDER 35 U.S.C. §103

Claims 1-11 stand rejected under 35 U.S.C. §103(a) as being unpatentable over WO 0154971 to Varis (hereafter "*Varis*") in view of EP 0255136 to Ogura (hereafter "*Ogura*") on the grounds set forth in paragraph 12 of the Official Action. For at least the reasons noted below, this rejection should be withdrawn.

Varis is directed to a space arrangement in a ship. The ship includes a CRP system (e.g., Fig. 1). As acknowledged in the grounds for rejection, *Varis* fails to

disclose a cap associated with a forward propeller including at least two equally distributed flow plates or blades. *Ogura* is directed to a single propeller arrangement which includes a boss cap with "fins." In light of the teachings of *Ogura*, it is asserted in the grounds for rejection that it would have been obvious to "modify to provide a propeller cap with flow plates as taught by *Ogura* for the forward propeller hub of *Varis* to create the invention as claimed by applicant." This assertion is respectfully traversed.

As noted above, *Ogura* is directed to a an arrangement having but a single screw propeller. As such, the technical problems associated with such an arrangement are drastically different than that of a CRP system of the type set forth in claims 1 and 11. As previously discussed herein, the present invention is constructed so as to eliminate not only the undesirable effects of cavitation which may be produced by hub vortexes, but also the undesirable cavitation effects which can arise during turning of the aft propeller such that it crosses in the wake of the first propeller in an area of separation between the forward and aft propellers of a CRP system. As such, the propeller and hub arrangement of *Ogura* is not designed with these operating conditions in mind. For example, applicants advise that due to the pitched or angled fin construction provided on the boss cap (5) of *Ogura* could in fact promote the occurrence of cavitation during steering of a thruster so as to place the aft propeller and forward propellers at an angle relative to one another. In other words, providing a cap or boss associated with a forward propeller of a CRP system with a thin construction taught by *Ogura* would be expected to produce even worse cavitation problems than a conventional CRP system which included no such fins at all.

In light of the above, it is respectfully submitted that one of ordinary skill in the art would not have modified the cap associated with the forward propeller of the arrangement of *Varis* by providing fins constructed as taught by *Ogura* thereon. In fact, one of ordinary skill in the art, understanding the effects and interaction between the forward and aft propellers during operation of a CRP system, would have been led away from such a modification for the reasons noted above.

Moreover, as noted above, *Ogura*, being directed to a propulsion arrangement including a single propeller, provides no guidance whatsoever as to whether or not "fins" should be provided on a propulsion system which operates on entirely different principles, such as the claimed CRP system. In this regard, it is noted that *Ogura* provides no guidance to one of ordinary skill in the art whatsoever as to whether the fins should be associated with the cap provided on the forward propeller versus the cap provided on the aft propeller.

For at least the reasons noted above, reconsideration and withdrawal of the rejection is respectfully requested.

The remaining claims depend either directly or indirectly upon claim 1. Thus, the remaining claims are also distinguishable over the proposed combination of *Varis* and *Ogura* for at least the same reasons above. In addition, applicants note that claim 4 specifies that the flow blades are "straight and similar to each other." By contrast, the corresponding blades of *Ogura* are not "straight." Thus, claim 4 is distinguishable over the proposed combination for at least this additional reason.

Claims 1-11 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Varis* in view of NO 10907 (hereafter "*Parsons*") on the grounds set forth in

paragraph 13 of the Official Action. For at least the reasons noted below, this rejection should be withdrawn.

Varis is applied in the same manner set forth above.

Parsons is cited as allegedly teaching providing a cone with flow plates to help reduce cavitation effects. On this basis, it is concluded that it would have been obvious to modify the forward propeller hub of *Varis* to create the invention the invention as claimed by applicant. This is assertion is respectfully traversed.

This rejection is traversed on similar grounds as previously set forth above in connection with the rejection of *Varis* in view of *Ogura*. Namely, like *Ogura*, *Parsons* is directed to a propulsion system having a single propeller. Thus, the cavitation effects an operating condition experienced during operation of a CRP system, such as when the aft and forward propellers are angled relative to one another, such as the case when the aft propeller is turned for steering purposes. Thus, *Parsons* provides no guidance whatsoever to one of ordinary skill in the art with respect to placement of plates or blades on a cap associated with a propeller of a CRP system. In particular, *Parsons* fails to provide the necessary expectation of success that such an arrangement would be successful in producing beneficial results in such a propulsion arrangement as that recited by the presently claimed invention. Moreover, *Parsons* fails to provide any guidance to one of ordinary skill in the art as to whether plates or plates should be associated with a cap on the forward versus the aft propeller of a CRP system. Thus, the proposed combination of *Varis* and *Parsons* is inappropriate for at least the reasons noted above. Reconsideration and withdrawal of the rejection is respectfully requested.

The remaining claims depend either directly or indirectly upon claim 1. Thus, these claims are also distinguishable over *Varis* in view of *Parsons* for at least the same reasons noted above.

Claims 1-11 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Varis* in view of SE 61072 (hereafter "*Akimoff*") on the grounds set forth in paragraph 14 of the Official Action. For at least the reasons noted below, this rejection should be withdrawn.

Varis is applied in the same manner set forth in the previous grounds of rejection noted above.

Akimoff is directed to a propulsion system having a single propeller. Thus, the grounds for rejection are traversed on the same basis as that set forth above. Namely, *Akimoff* fails to provide any guidance or reasonable expectation of success, to one of ordinary skill in the art that the extended propeller hub having the configuration described therein would produce beneficial results in a propulsion system operating under entirely different principles, such as the CRP system recited in amended claims 1 and 11. Thus, reconsideration and withdrawal of the rejection is respectfully requested.

The remaining claims depend either directly or indirectly upon claim 1. Thus, these claims are also distinguishable over *Varis* in view of *Akimoff* for at least the same reasons noted above.

CONCLUSION

From the foregoing, further and favorable action in the form of a Notice of Allowance is earnestly solicited. Should the Examiner feel that any issues remain, it

is requested that the undersigned be contacted so that any such issues may be adequately addressed and prosecution of the instant application expedited.

Respectfully submitted,

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